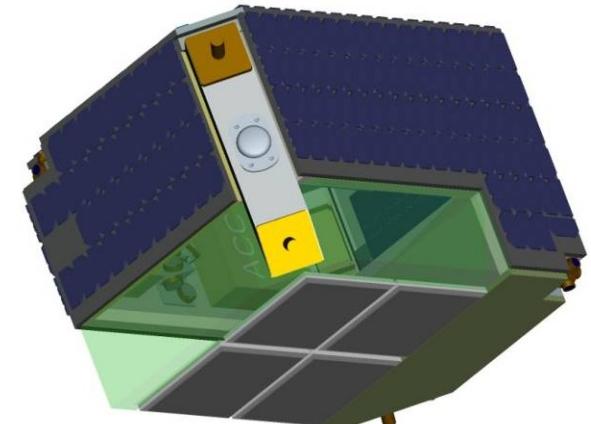


# COM DEV AIS Initiative



TEXAS II Meeting  
September 03, 2008

Ian D'Souza



## Report Documentation Page

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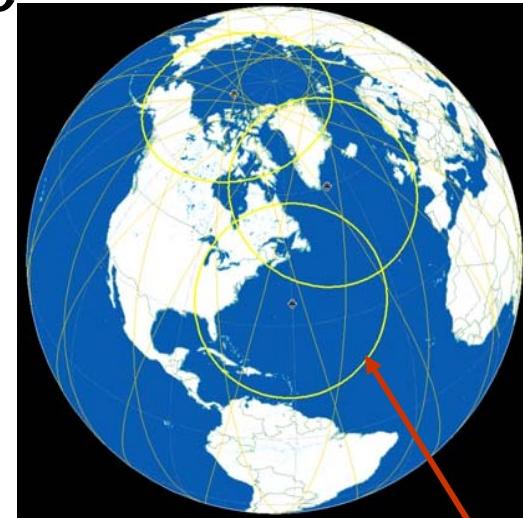


# AIS from Space – The Challenge

Some important technical questions:

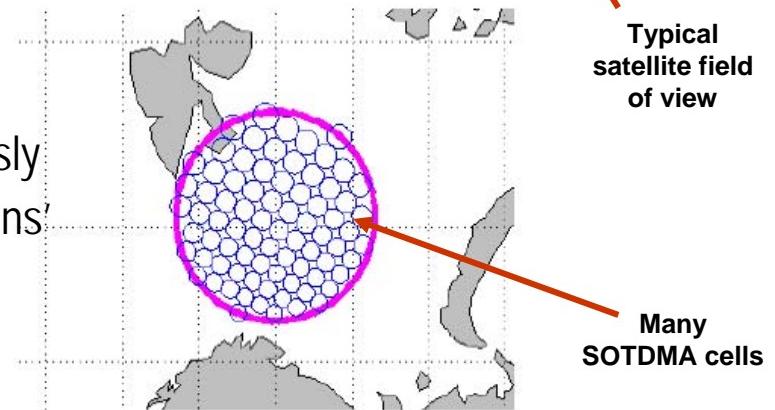
Is the AIS signal strength seen from space enough?

- System, and ship transmitters/antennas designed for local terrestrial communication only



Field of view from space is large:

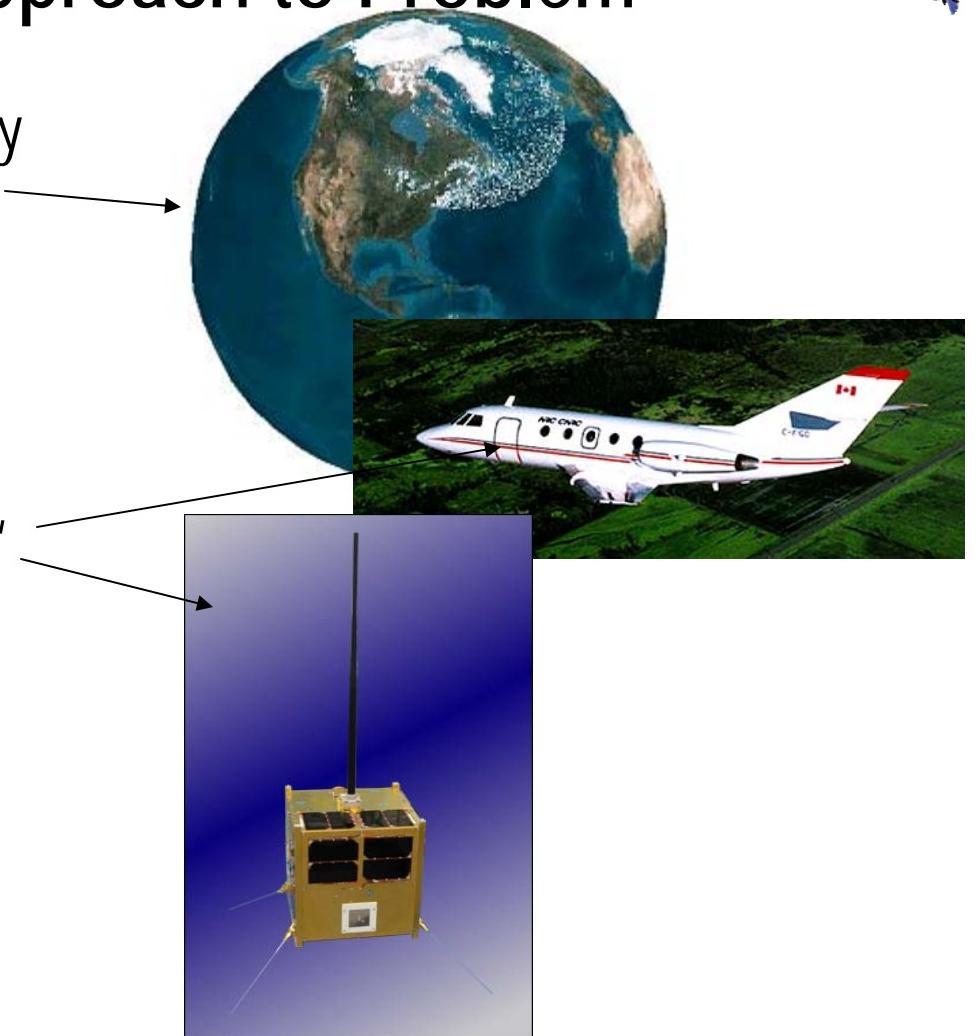
- Many SOTDMA cells will be in view simultaneously
- Signals from different cells will overlap - 'Collisions'





# COM DEV Systematic Approach to Problem

- Simulations show high probability of detection using COM DEV's receiver for capture of large numbers of ships
- This has been verified in ground, aircraft and now space trial
- The measured data shows that the performance of the COM DEV receiver is superior to a standard commercial receiver.

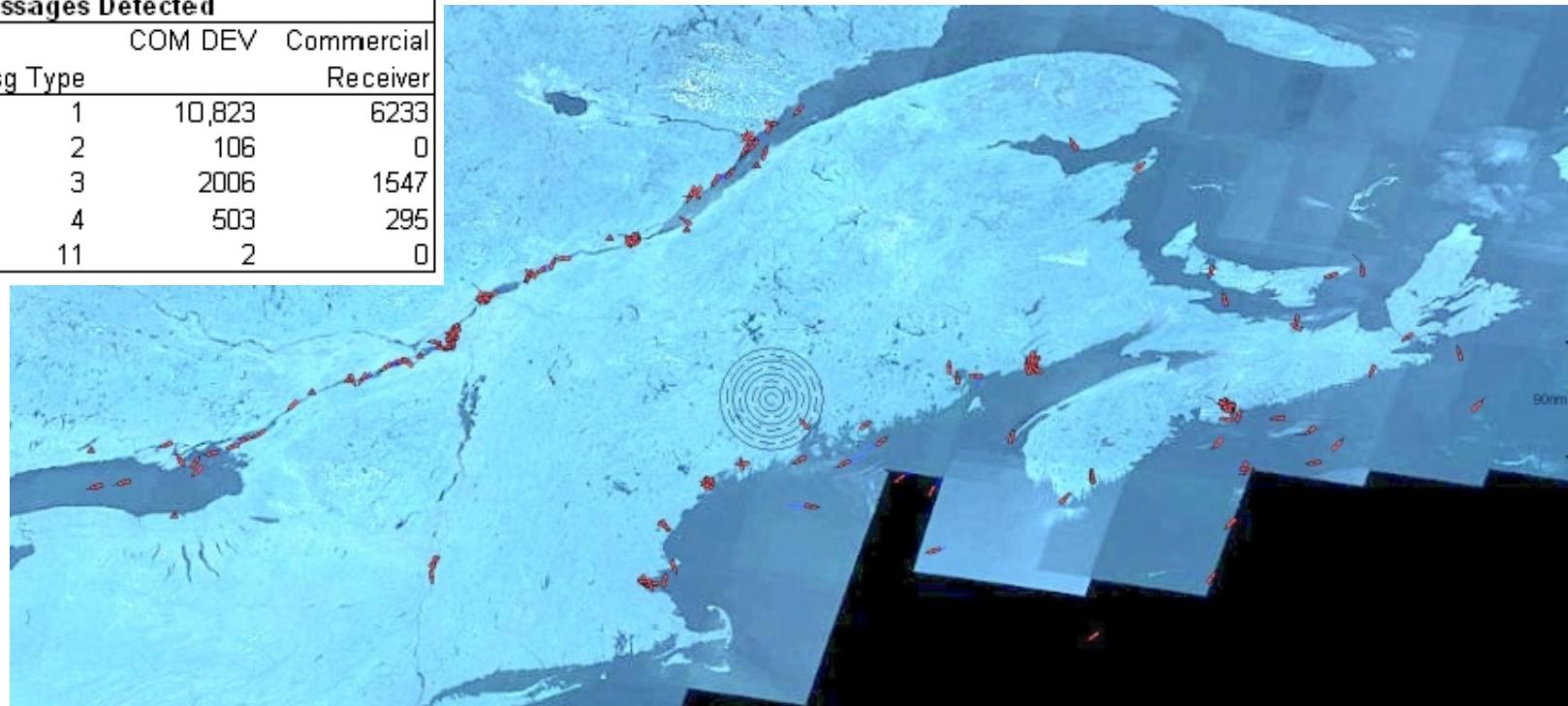




# Flight from Ottawa to Halifax

Messages Detected		
	COM DEV	Commercial
Msg Type	Receiver	
1	10,823	6233
2	106	0
3	2006	1547
4	503	295
11	2	0

The red dots are ships detected (220)



Field of view: 600 km diameter from FL280, Data taken Dec 4, after major snow-storm  
COM DEV system already shown to be approx twice as sensitive as the commercial AIS receiver on this flight (despite low altitude, small footprint, few collisions).



# Nano-satellite Tracking of Ships

Designed to be launched *quickly*, to perform key *validation* of COM DEV AIS radio technology:

- verify ability to get AIS messages
- understand the noise environment
- get insight into global ship traffic density and distribution
- compare performance against commercial AIS receivers, validate the simulations

**NTS was not designed to provide an operational capability**

- 7 months from kick-off to launch
  - Use available bus design: restrict bus design changes to minimum to meet schedule
  - scaled-back payload design, minimum to verify concepts
- Focussed mission objectives
  - Take several 85 s snapshots globally. Two to four-days snapshot download, limited by on-board memory, bus data link

**Project kick-off in September 2007, Launched on 28<sup>th</sup> April 2008**



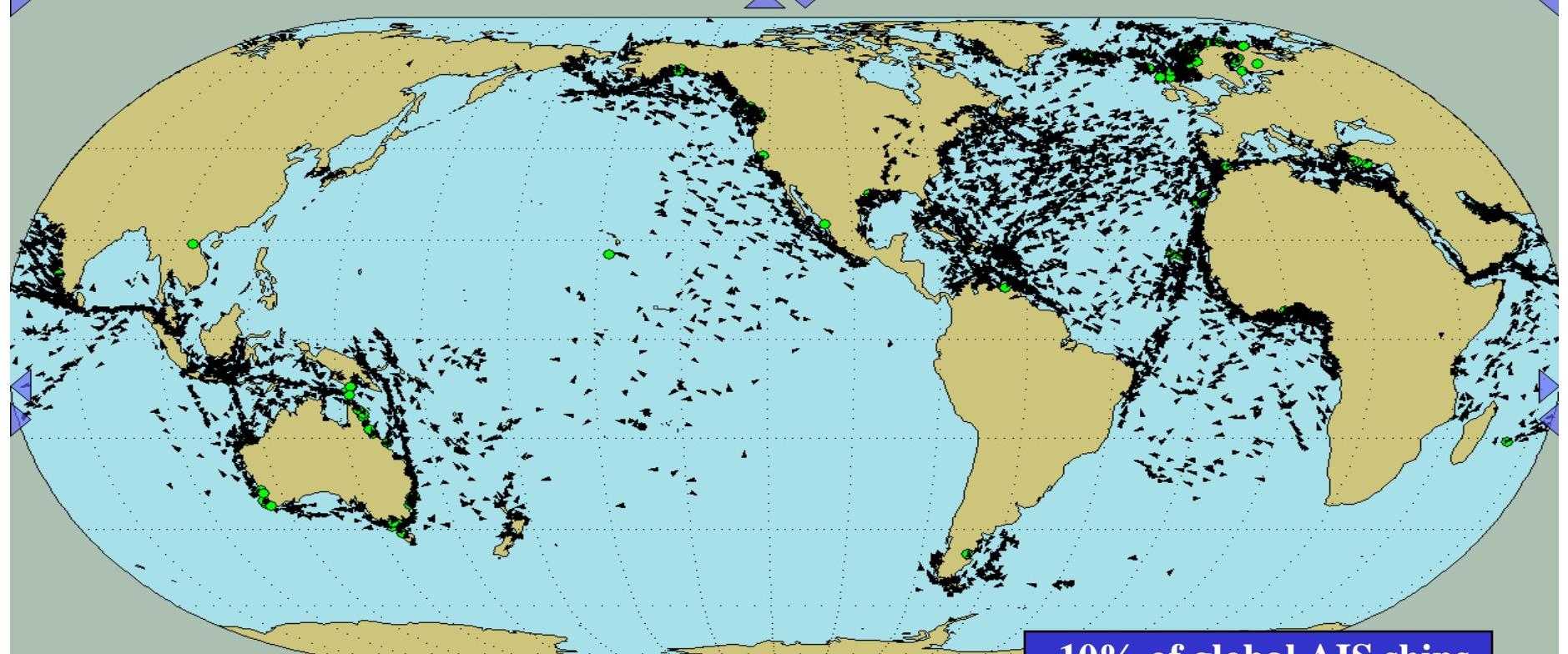
# COM DEV nano-Satellite: NTS



NTS integrated on PSLV C9  
upper stage



NTS – World's First Demonstration of Advanced AIS detection from Space

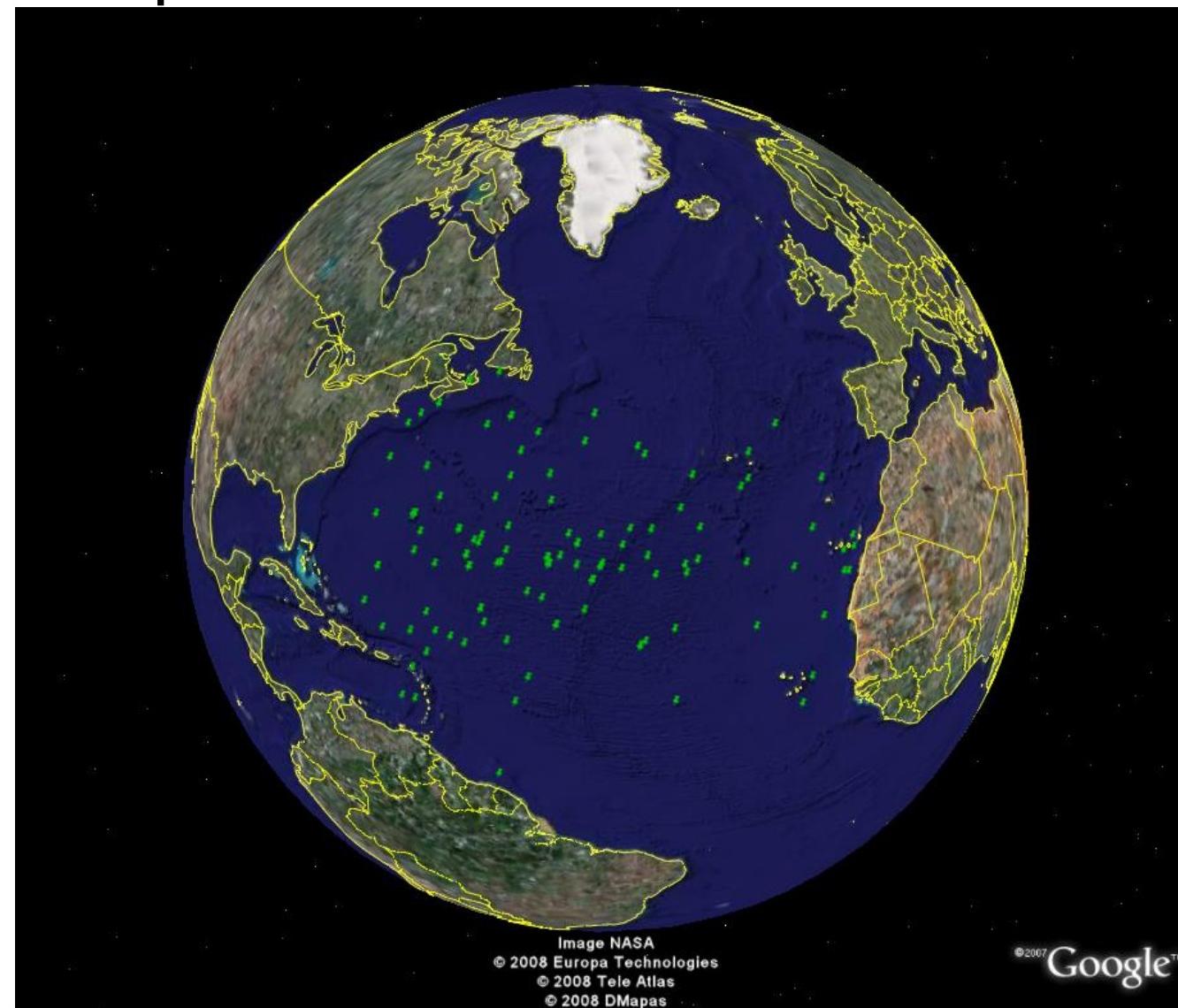


## Latest global snapshot

~10% of global AIS ships  
from 135 Flag States  
in 1700 seconds

21,635 AIS messages (in 20 snapshots ~85 seconds each) detected 13 msg/s.  
6976 class A ships, 30 class B ships, 94 base stations and 1 search and rescue aircraft

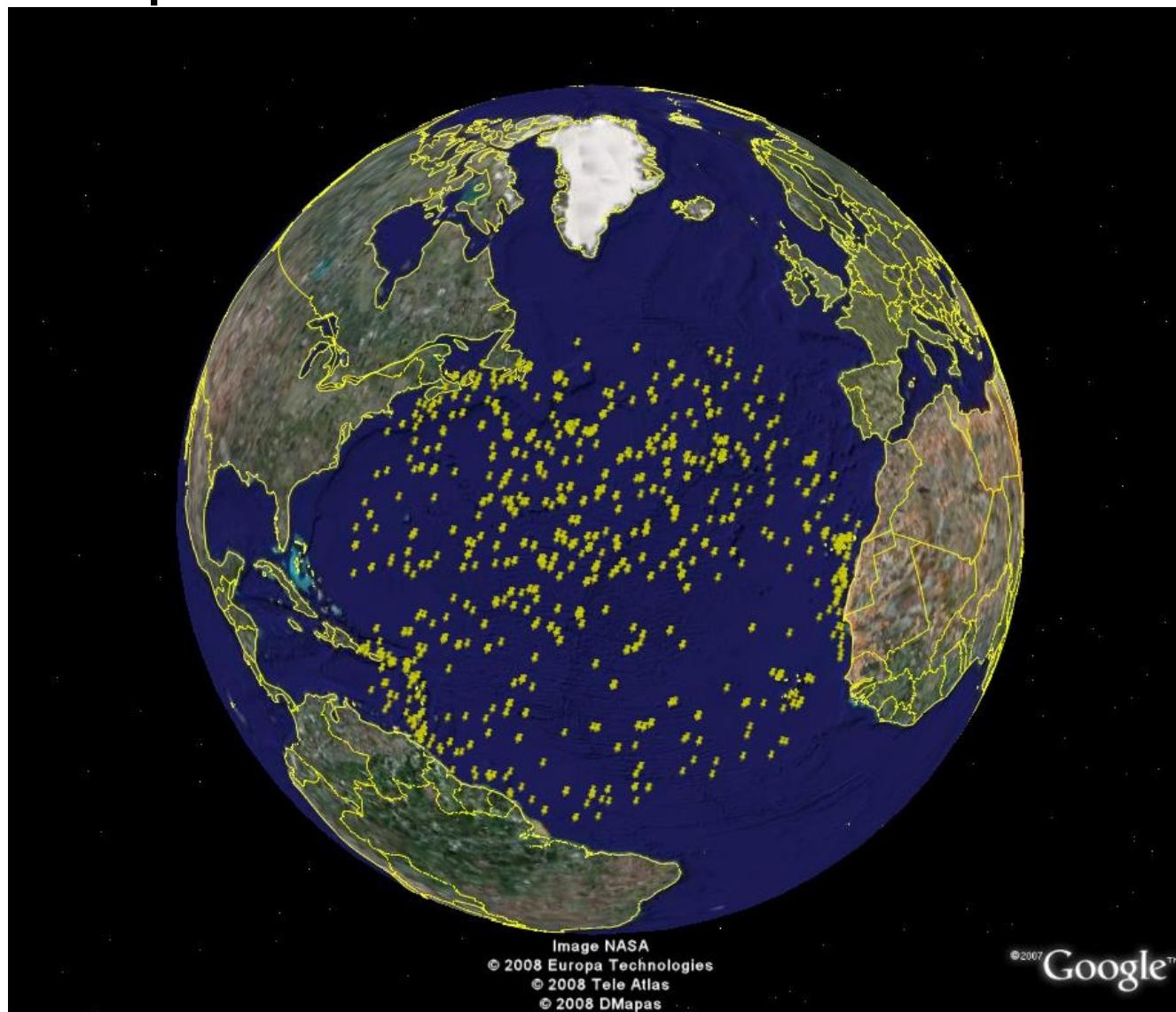
# Comparison: Commercial Rx vs COM DEV Rx



50 seconds of AIS  
messages from  
Commercial Receiver  
when NTS data  
replayed through it

# Comparison: Commercial Rx vs COM DEV Rx

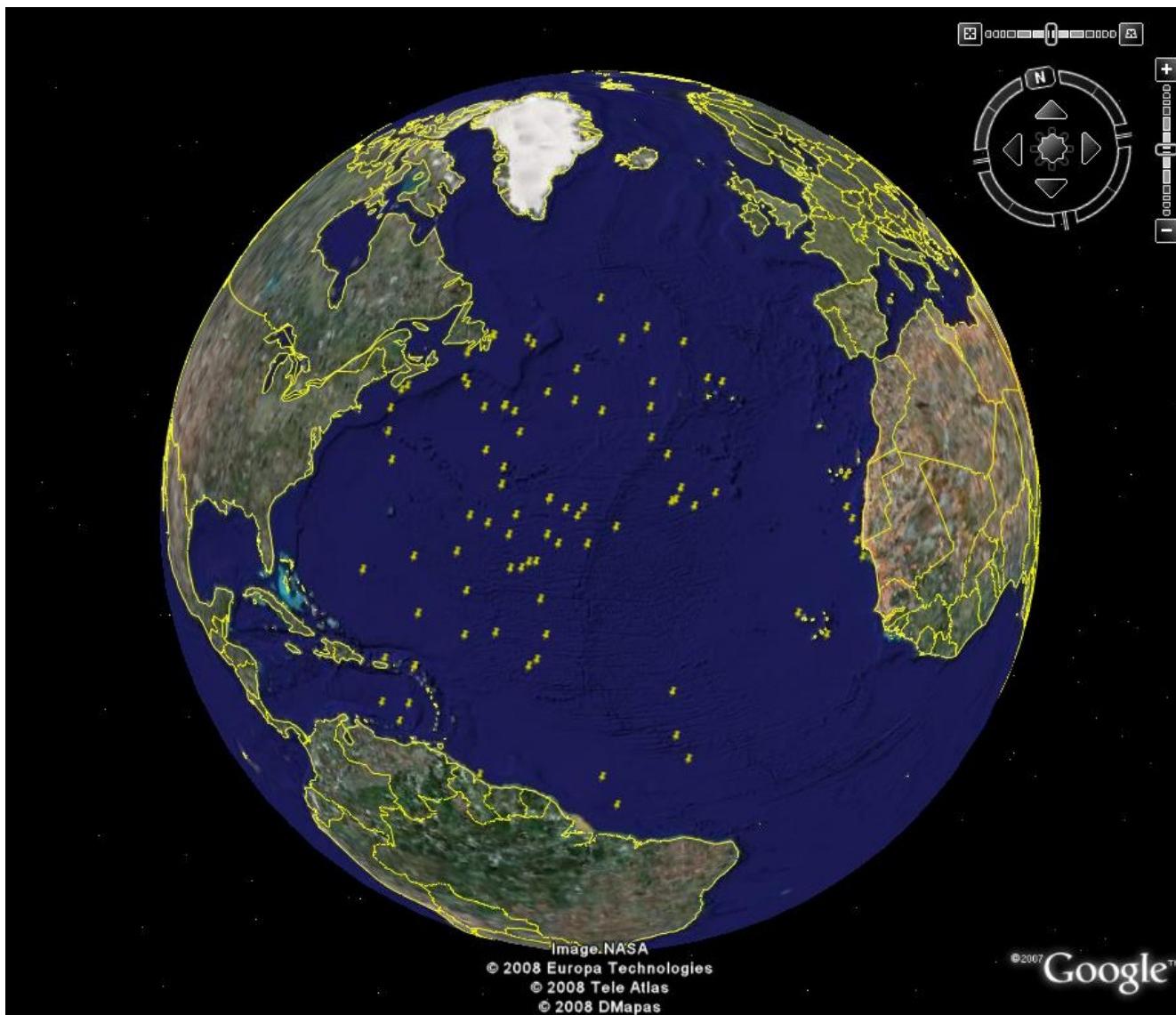
 COM DEV



Identical 50 seconds  
of data from COM  
DEV approach

# Mid-Atlantic Data ( 3 s observation time)

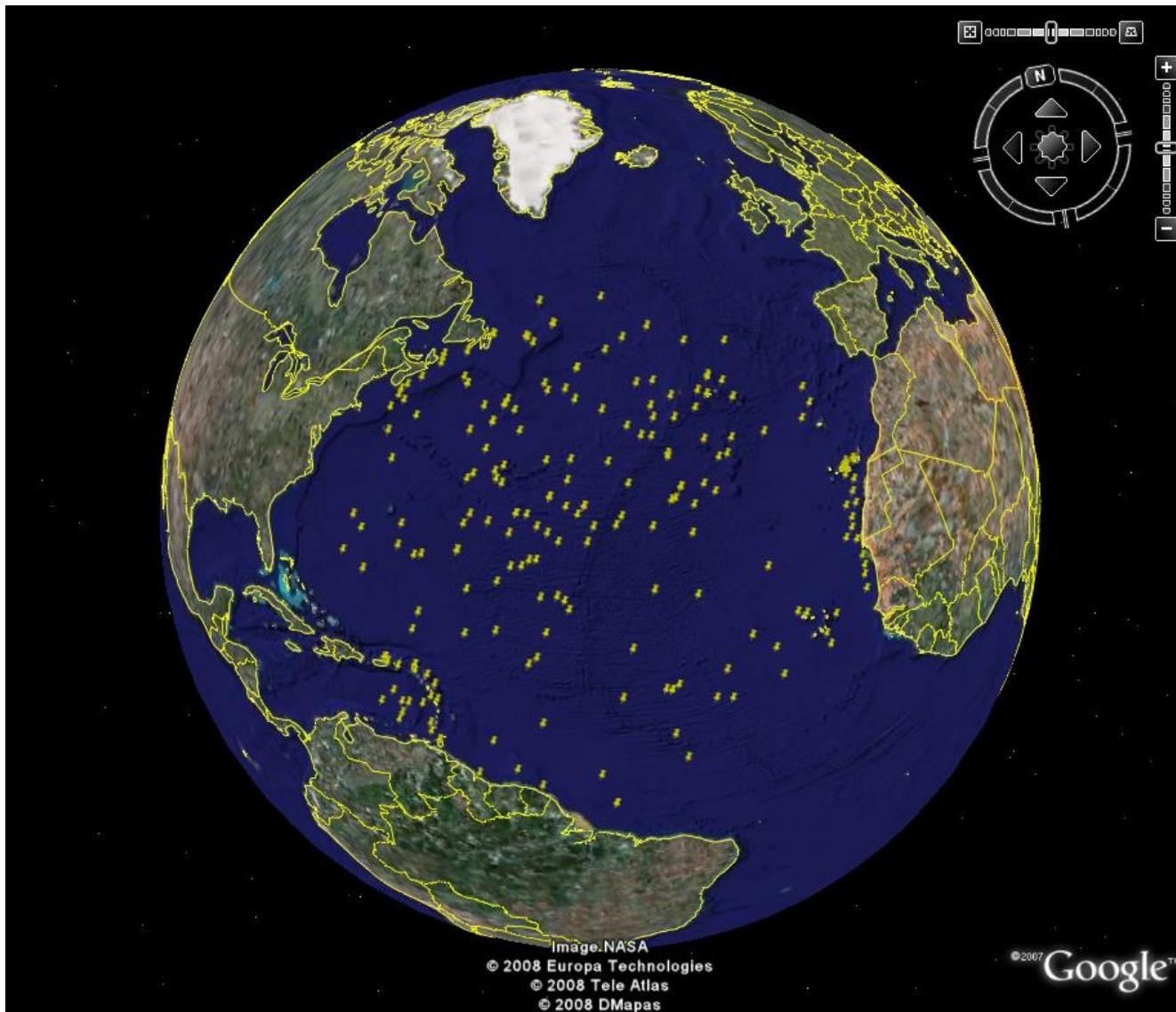
 COM DEV

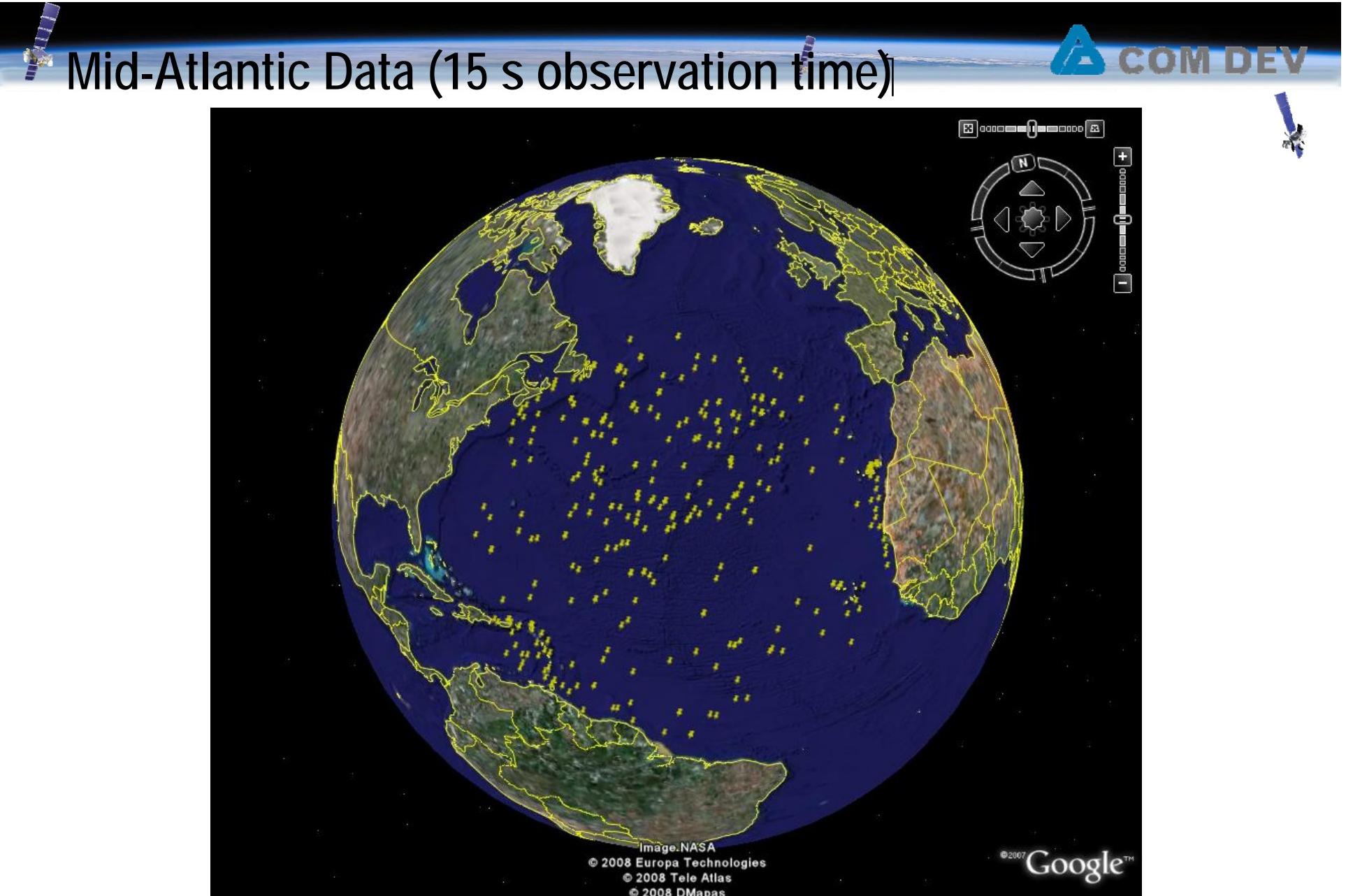




# Mid-Atlantic Data (9 s observation time)

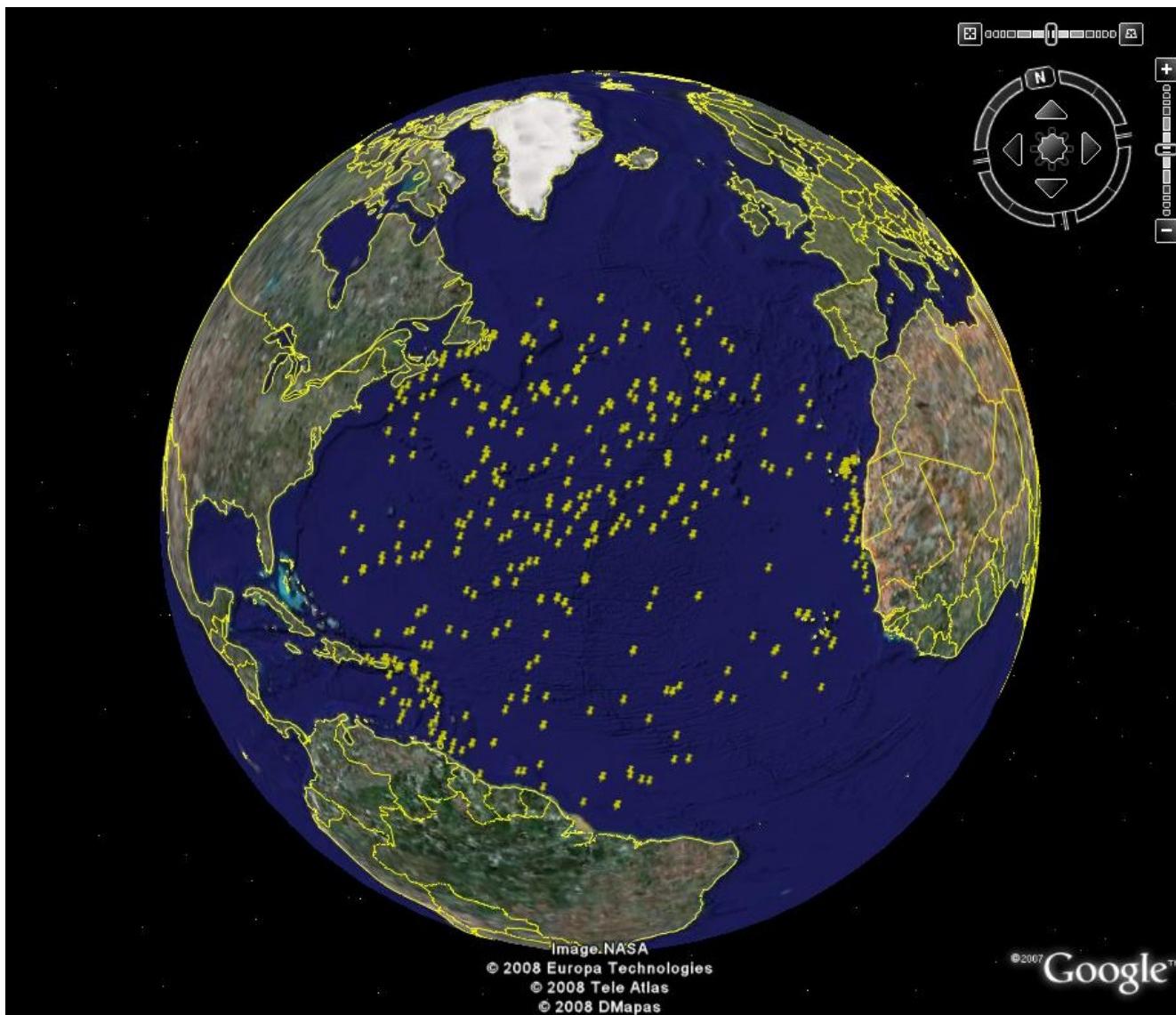
 COM DEV





# Mid-Atlantic Data (20 s observation time)

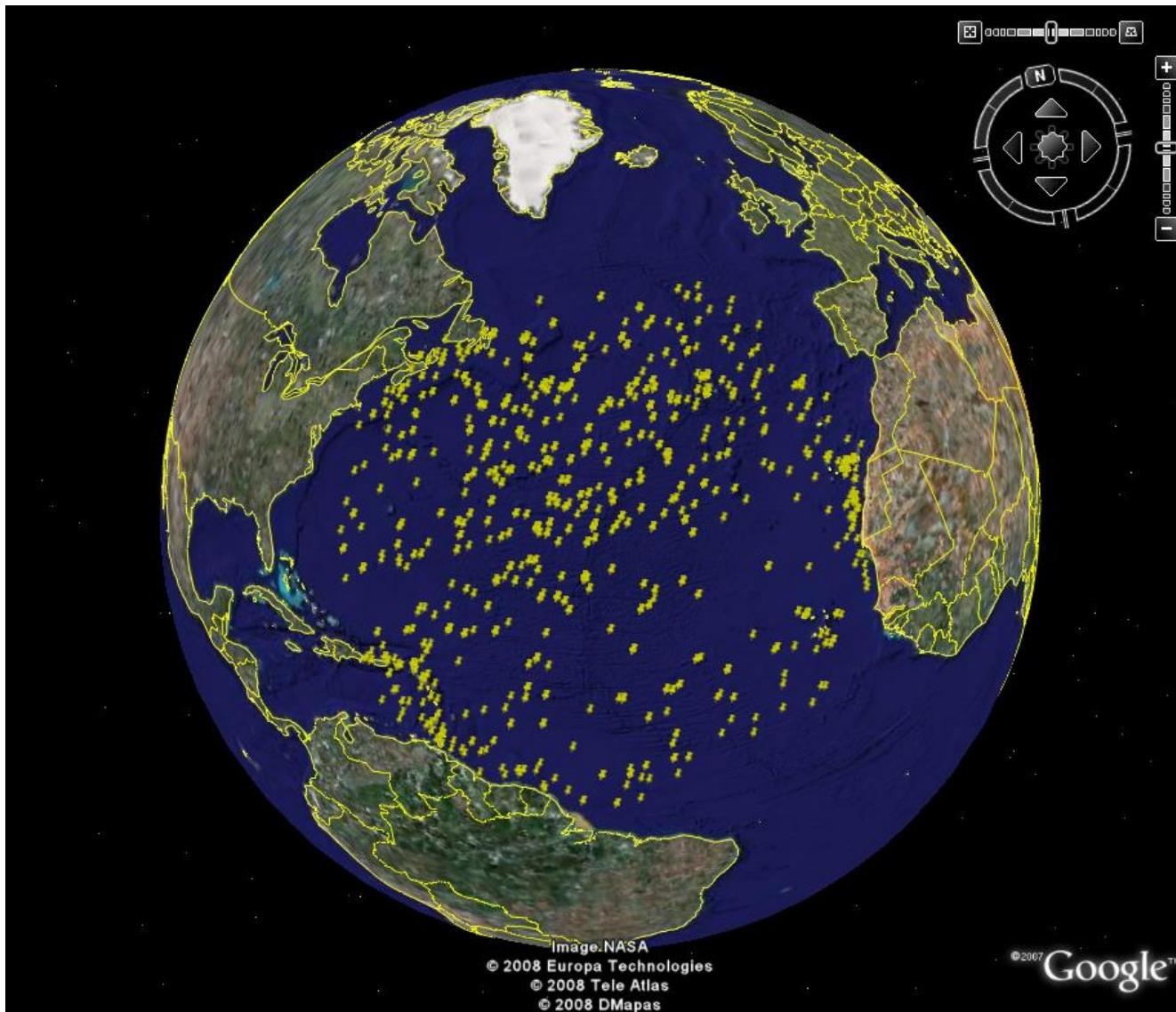
 COM DEV

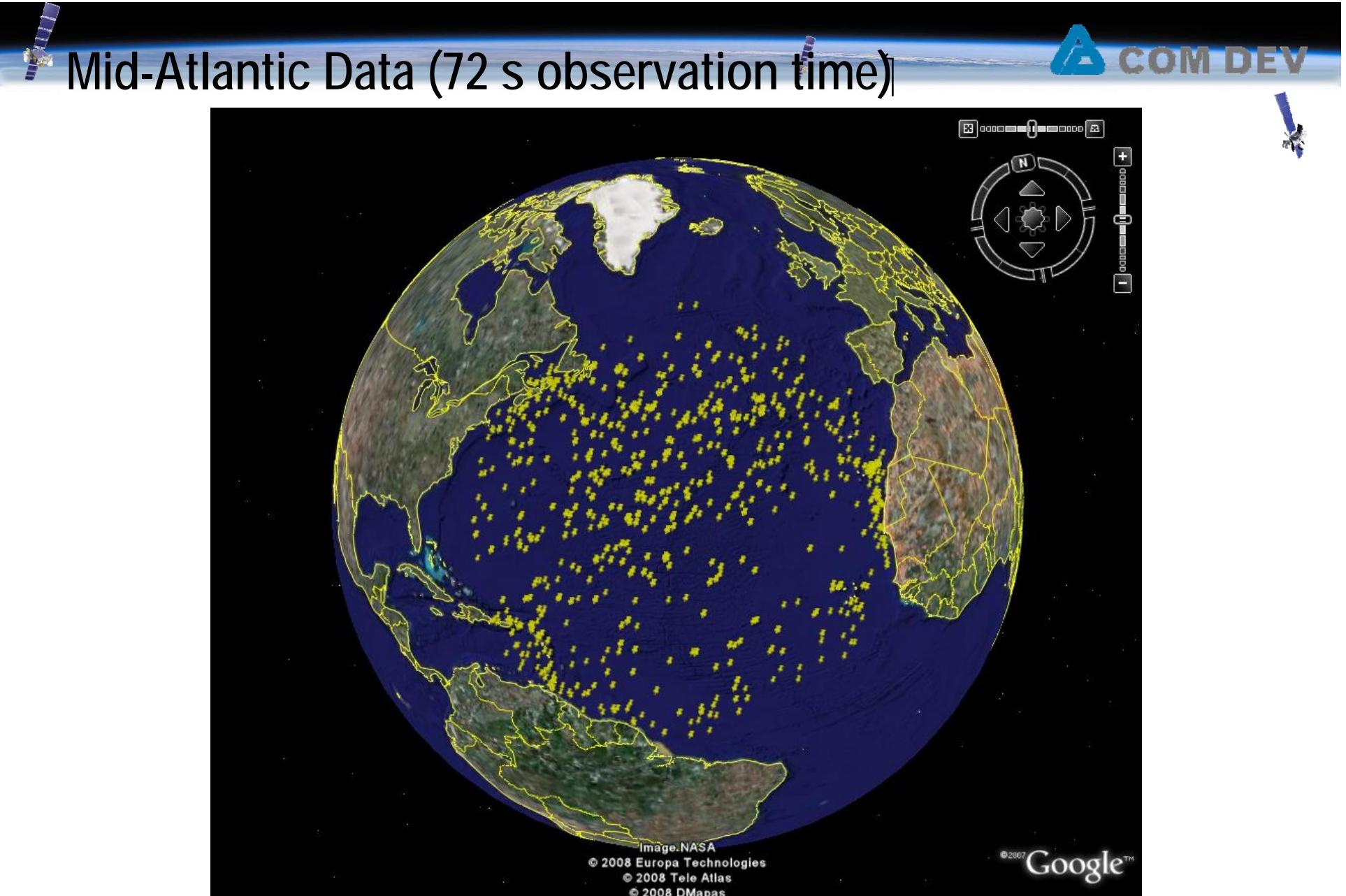


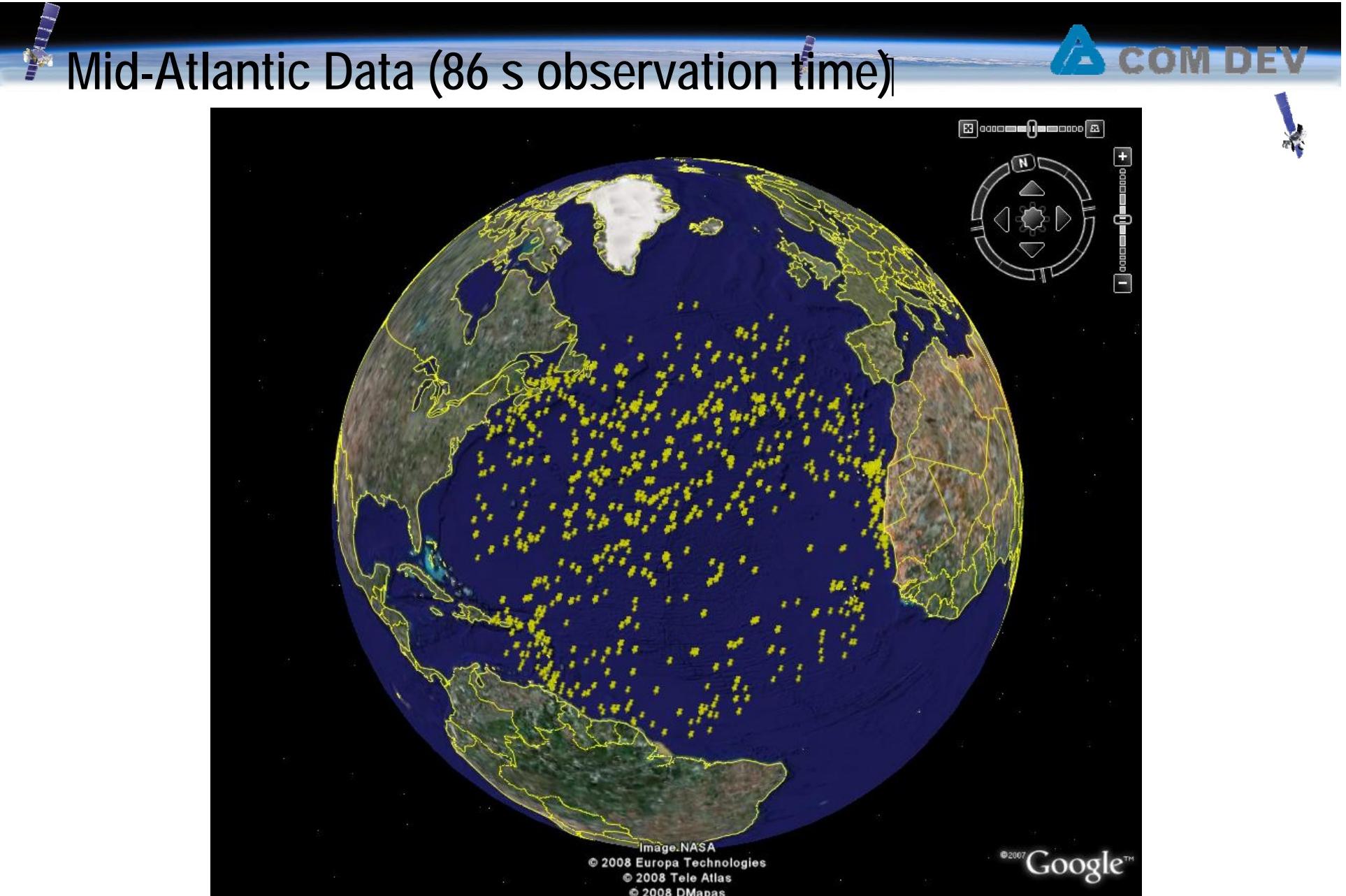


# Mid-Atlantic Data (50 s observation time)

 COM DEV





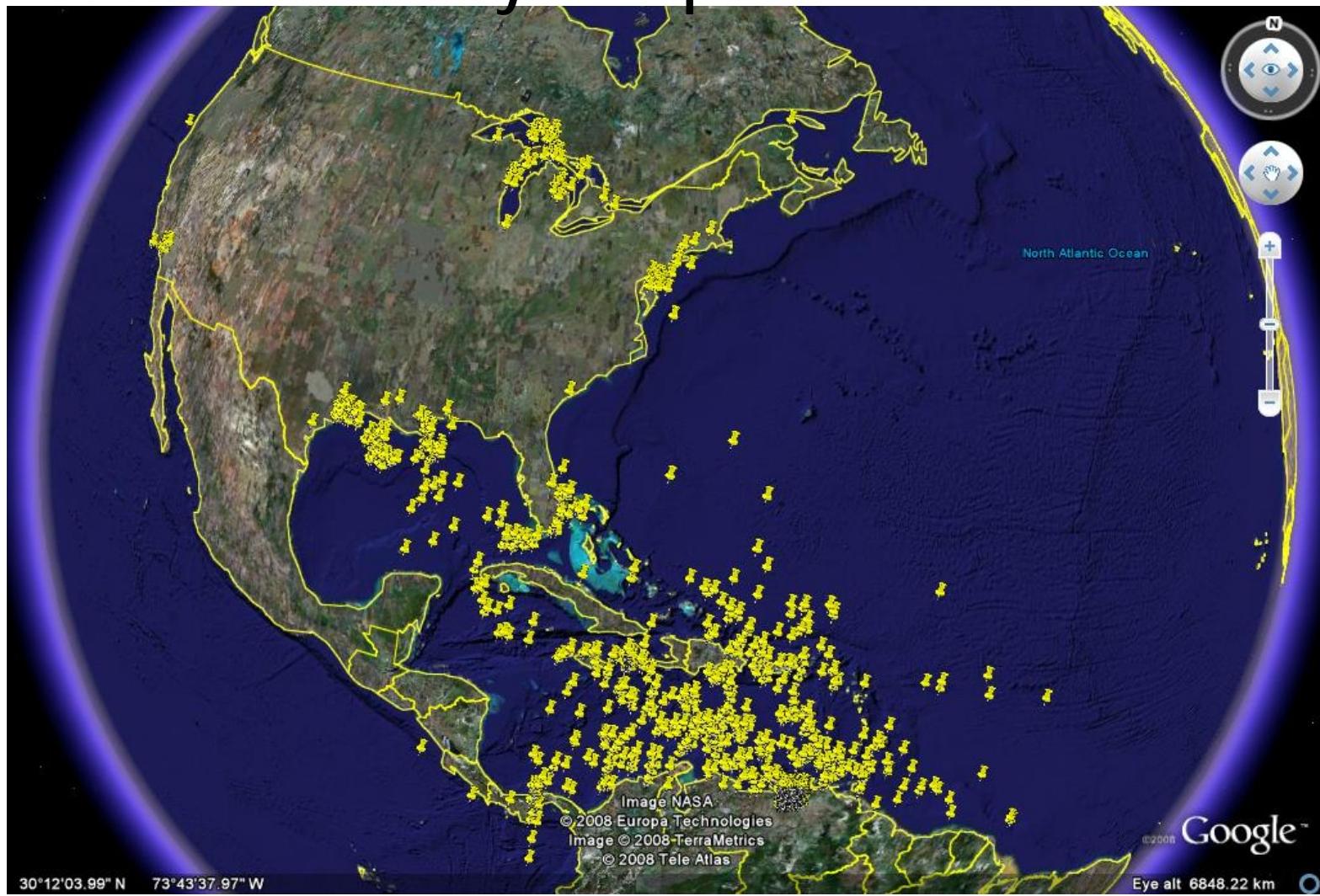




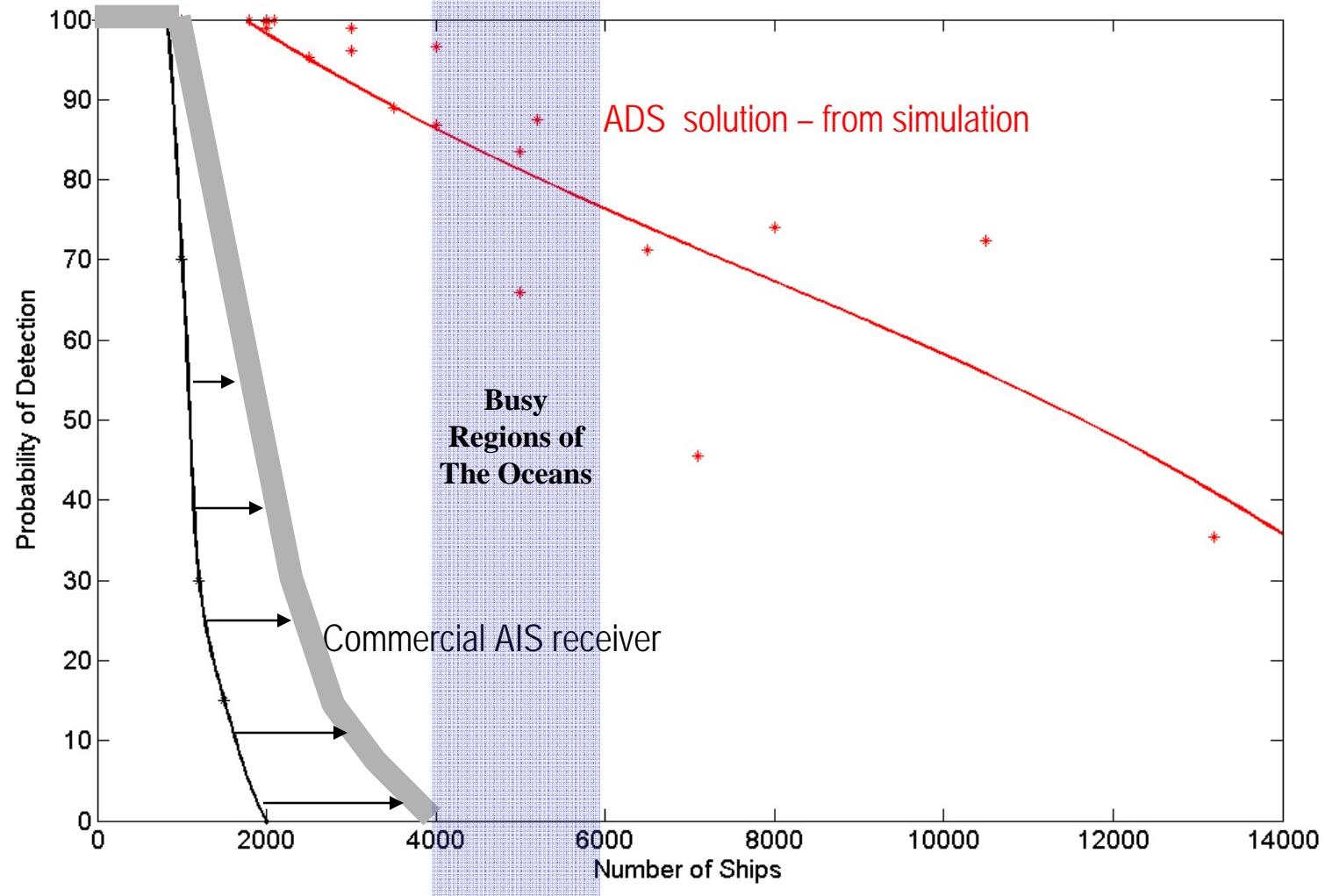
Movie



# Simulation of full system performance



# Comparison of performance of a single receiver over an observation pass of 10 minutes

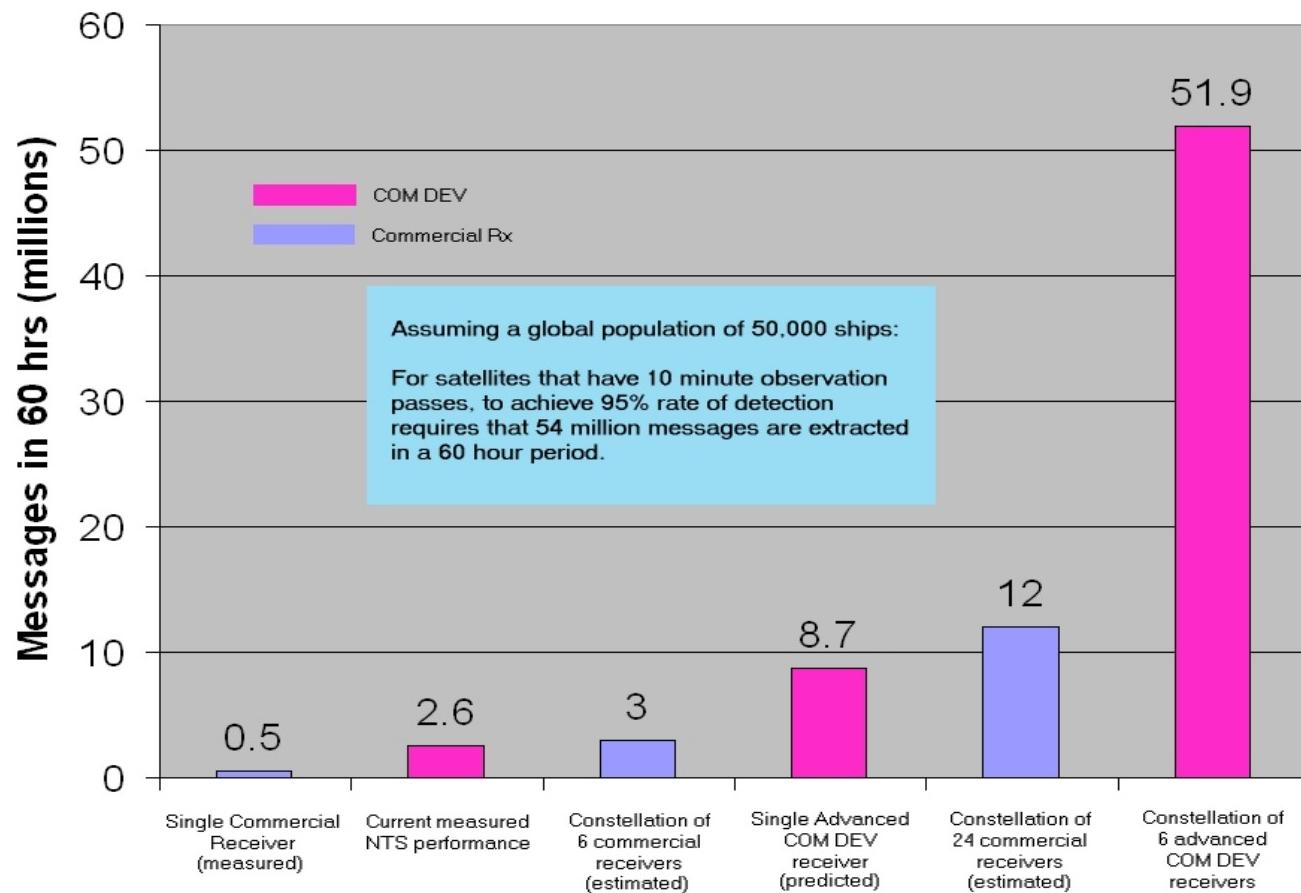




# Comparison with Commercial receiver

For a 95% detection rate of an active global AIS Class A population of 50,000 ships over 10 minutes implies that 54,000,000 messages are being detected in a 60 hour period

**Comparison With Commercial Receiver**





# Conclusions

- AIS detection from space is viable
- High detection rates for ships can only be accomplished using smart AIS receiving capability